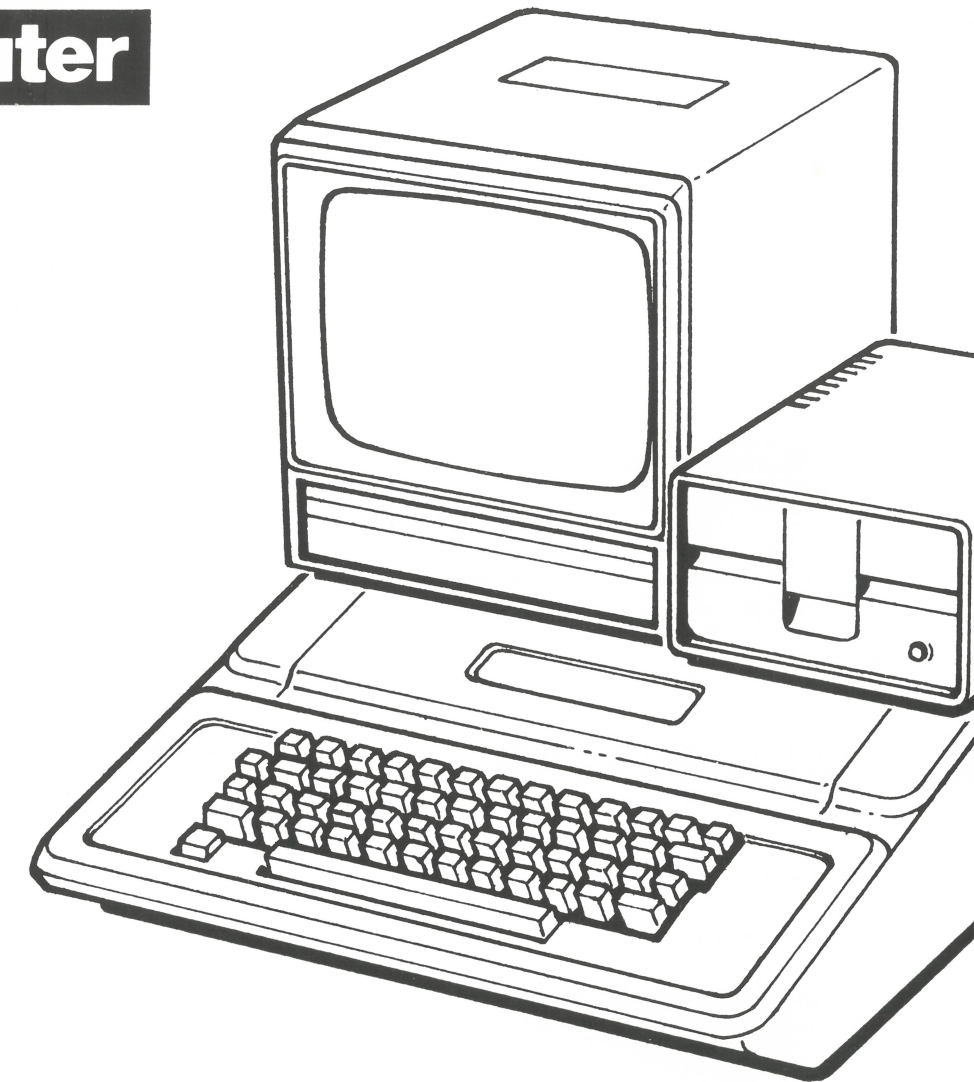


E.M.E

**microcomputer
program**



PHYSICAL OR CHEMICAL

STUDY GUIDE

by

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TEXTBOOK CORRELATION GUIDE

Addison Wesley Science	Book 5, Chapter 3
Coronado Science & Technology	Book 3, Unit 1, Chapters 1-2
Harcourt Brace Science	Book 3, Unit 4 Book 4, Unit 4, Chapter 2,3 Book 5, Unit 5, Chapters 1-3
Heath Science	Book 4, Unit 3, Chapter 4 Book 6, Unit 2, Chapter 5
Holt Elementary Science	Book 6, Unit 3, Chapters 7-9
Laidlaw Exploring Science	Book 4, Unit 4, Chapters 1-3 Book 6, Unit 3
Merrill Accent on Science	Book 3, Unit 3, Chapters 1-4 Book 5, Unit 2, Chapter 3 Book 6, Unit 2, Chapter 2
Scott Foresman Science	Book 5, Chapters 10,12
Silver Burdett Science	Book 3, Unit 2, Chapter 5 Book 4, Unit 2, Chapter 5 Book 5, Unit 2, Chapter 6 Book 6, Unit 2, Chapter 6

OVERVIEW

The E.M.E PHYSICAL OR CHEMICAL program will help middle and upper grade elementary students to understand the difference between physical and chemical properties and to distinguish physical from chemical changes. The program consists of two parts:

1. Explanation -- covers physical properties (mass, volume, state, color, luster, odor and taste) and physical changes of state. Defines chemical properties and shows how these determine the way in which one substance reacts with another. A convenient forward/backward feature allows review at any point.
2. Quiz -- consists of 15 randomly-selected questions where the student identifies a change as physical or chemical. A short explanation is provided if a question is incorrectly answered. Quiz score is provided at the end.

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OBJECTIVES

The following concepts are developed in the program:

1. All matter occupies space and has mass.
2. Properties such as texture, color, odor, shape, hardness, lightness and heaviness are physical properties.
3. The three states of matter are solid, liquid and gas.
4. Matter changes from one state to another at certain temperatures.
5. A chemical change results in a new substance being formed.
6. Properties that describe the behavior of a substance reacting with other substances are called chemical properties.

After using this program students will be able to:

1. Recognize the physical properties of various objects and name the senses used to identify each property.
2. Identify and measure the properties of volume and mass.

3. Create and describe a physical change.
4. Identify the chemical properties of matter and describe a chemical change.

USING THE PROGRAM

The PHYSICAL OR CHEMICAL program is easy to use and is under your control at all times. The program loads automatically and is ready to use immediately. We suggest that students start with the Explanation section. This provides the background needed to understand physical and chemical changes and to answer the questions in Part 2. The program is designed for Grades 3 and up.

You may wish to assign a student who has taken the quiz as your representative at the computer to record the scores of other students who take the quiz. The Quiz section of PHYSICAL OR CHEMICAL may also be used as an evaluation instrument by teachers who have completed a unit on chemistry or changes in matter.

BACKGROUND INFORMATION

At ordinary temperatures, matter exists in three states: solid, liquid and gas. A fourth state or phase of matter, called plasma, exists at very high temperatures. Plasma exists inside stars, where temperatures are several thousand degrees Celsius. In this program we shall deal only with solids, liquids and gases.

A solid has a definite shape. Examples of solids include blocks of wood, magnets, copper pipes, ice, plastic containers, paper boxes and silverware. A liquid does not have a definite shape, but rather takes the shape of its container. The most familiar liquid is water. Other liquids include oil and mercury. Like a liquid, a gas has no definite shape. The air we breathe is a mixture of several gases with nitrogen the most abundant and oxygen next. There are also small amounts of carbon dioxide, water vapor and other gases present in air. Helium and hydrogen are other gases your students may know.

All matter, whether solid, liquid or gas, has two physical properties in common -- it takes up space and has mass. The amount of space a substance occupies is called its volume. A good example to discuss with students is air. An "empty" open container is filled with air. When anything is put into the container, air is displaced. Try this: fill a plastic sandwich bag with air. Place the air-filled bag over the mouth of a large jar and secure it tightly with a rubber band. Try to push the bag into the jar. The bag will not go into the jar because both are filled with air. If you pull the rubber band slightly away from the jar and then push on the bag, it will go into the jar because the air has a way to escape. You will be able to feel the air escape at the point you are holding the rubber band.

Mass is the amount of matter in something. The mass of any object depends on the kind of matter of which it is made. A cubic meter of wood and a cubic meter of iron occupy the same volume but the iron's mass is much greater. Generally, larger objects have a greater mass than smaller objects. However, a bowling ball has more mass than a basketball even though the basketball has a greater volume. Two objects have the same mass if they balance each other on an equal-arm balance.

The physical properties of matter can be observed with your senses. (Safety note -- caution your students never to taste or directly smell materials.) Have the students list the senses employed in studying the physical properties of different kinds of matter. Their list may include:

seeing: color, shape

touching or feeling: soft, hard, rough, smooth, light, heavy

tasting: sweet, sour, bitter

smelling: has no odor, smells sweet, awful

Have the students make up a list of properties of sugar and salt that they can observe using only their senses.

Physical changes involve changes in form or state. If a student bends wire, changes the shape of a lump of clay or freezes water, the chemical composition of the substance is not changed. Since no new substance was created, the changes in the wire, clay and water are called physical changes.

A property that tells how one substance reacts with another to form a new substance is a chemical property. When one or more new substances are formed, a chemical reaction has occurred. The new substance(s) will have physical and chemical properties different from those of the original substance(s).

The rusting of iron is an example of a chemical reaction. Iron is metallic and strong. When it is exposed to oxygen it is changed to a brittle, reddish material called iron oxide, also known as rust. The ability of iron to combine with oxygen to form a new substance is a chemical property.

Other metals such as magnesium and aluminum also combine with oxygen to form new substances. Thus, most metals are said to have similar chemical properties. Other substances that can be grouped by similar chemical properties include acids, bases, salts, sugars and alcohols.

STUDENT ACTIVITIES

1. Changing state: most students are familiar with water in its three different states -- ice, water and water vapor. Set up an "ice cube race" with each student given an ice cube, a cup and paper towels or newspaper. The object is to melt the ice cube as quickly as possible. Do not allow students to place the ice cube in their mouths. This activity can also be done with the objective of keeping the ice cube from melting for as long as possible.
2. Chemical reactions: Place a piece of wet steel wool in a jar and cover it. Check an hour later and a day later. Ask students for possible explanations.

TEACHER DEMONSTRATION

Obtain small, thin samples of magnesium ribbon, zinc, iron (steel wool), copper and tin. CAUTION: Use safety goggles and do not look directly at burning magnesium. Hold each piece of metal with forceps over a Bunsen burner placed on a fireproof surface.

Have students record the physical properties of each metal before and after burning. Also have them list the metals in order from easiest to burn to hardest to burn.

GLOSSARY

chemical change - a change that results in making one or more new substances.

chemical property - a characteristic that tells how a substance reacts with one or more substances to form one or more new substances.

gas - a state of matter in which a substance expands to fill a closed container.

liquid - a state of matter in which a substance assumes the shape of an open container.

physical change - a change in form or shape.

physical property - a characteristic of a substance which can be observed by one's senses.

solid - a state of matter in which a substance has a definite shape and volume.

volume - the amount of space occupied by a substance.

RESOURCES

Ardley, N.: ATOMS AND ENERGY, Franklin Watts, New York 1976.

Asimov I.: BUILDING BLOCKS OF THE UNIVERSE, Abelard-Schuman, New York 1974.

Bendick, J.: SOLIDS, LIQUIDS AND GASES, Franklin Watts, New York 1974.

Srivastara, J.: SPACES, SHAPES AND SIZES, Crowell, New York 1980.

FILMS

"A Look at Chemical Change," Mc-Graw-Hill, New York (15 minutes).

"Chemical Change All About Us," Coronet, Chicago (14 minutes).

"Matter, Matter Everywhere, How Materials Change," Coronet, Chicago (11 minutes).

This program uses a high-speed operating system called Diversi - DOS (tm) under license. For information contact DSR, Inc., 34880 Bunker Hill, Farmington MI 48018

STUDENT WORKSHEET ANSWERS

- | | | | |
|----------------------|------------|---------------|------------|
| 1. A chemical | F physical | 2. A physical | F chemical |
| B chemical | G physical | B chemical | G physical |
| C solid, liquid, gas | H space | C physical | H physical |
| D mass | I physical | D chemical | I physical |
| E chemical | J physical | E physical | J chemical |

Name _____

PHYSICAL OR CHEMICAL

1. Fill in the blank with the word that makes the statement correct.

- A. Properties that describe the way substances react with other substances are called _____ properties.
- B. When vinegar and baking soda are mixed, carbon dioxide (CO_2) is produced. This mixing is an example of a _____ change.
- C. Three states of matter are _____, _____ and _____.
- D. _____ is the amount of matter in something.
- E. Changes which produce new substances are called _____ changes.
- F. When water boils a _____ change takes place.
- G. Color is an example of a _____ property.
- H. Volume is the amount of _____ something takes up.
- I. A change in the shape of a material is called a _____ change.
- J. The _____ properties of matter may be observed by the senses.

2. Write the word physical or chemical in the blank.

- A. Cutting a piece of wood is a _____ change.
- B. Metal that is rusting is undergoing a _____ change.
- C. Stretching a wire is a _____ change.
- D. Baking a cake produces _____ changes.
- E. Freezing water to ice is a _____ change.
- F. Heating small pieces of wood in a test tube over a gas burner produces a _____ change.
- G. Breaking a piece of clay into two pieces is a _____ change.
- H. Stretching a rubber band is a _____ change.
- I. Mixing table salt and water is a _____ change.
- J. A candle burning is a _____ change.